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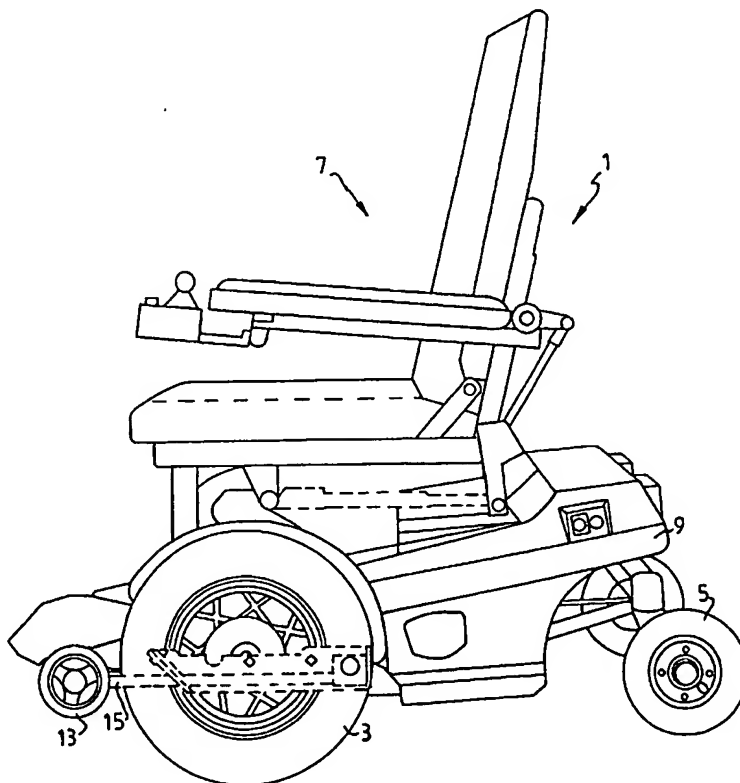


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<p>(21) International Application Number: PCT/SE00/00515 (22) International Filing Date: 16 March 2000 (16.03.00) (30) Priority Data: 9900977-1 17 March 1999 (17.03.99) SE (71) Applicant (for all designated States except US): PERMOBIL AB [SE/SE]; Box 120, S-860 00 Timrå (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): MIRZAIIE, Mehdi [SE/SE]; Färjevägen 64, S-865 33 Alnö (SE). (74) Agents: LINDÉN, Stefan et al.; Bergensträhle & Lindvall AB, Box 17704, S-118 93 Stockholm (SE).</p>		<p>(81) Designated States: CA, JP, KR, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. In English translation (filed in Swedish).</i></p>
<p>(54) Title: AN ANTI-TIP DEVICE FOR A WHEELCHAIR</p>		

(57) Abstract

An anti-tip device for a wheelchair (19) which also facilitates climbing comprise stabilizer wheels (13) which normally have no contact with the base or ground on which the wheelchair moves. The stabilizer wheels (13) are rotatably mounted at the front ends of bars (15) extending forwards beyond the front wheels of the wheelchair. The stabilizer wheels are thus located in front of the ordinary wheels of the wheelchair and their lower sides or edges are located in a plane located above the plane which passes through the lower sides or surfaces of the ordinary support wheels of the wheelchair. The bars (15) are relatively long and can move elastically and they have guides so that the stabilizer wheels (13) can move in vertical planes upwards from the rest position. An adjustment device restricts the upward movement.



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AN ANTI-TIP DEVICE FOR A WHEELCHAIR

FIELD OF THE INVENTION

The present invention is related to an anti-tip device for a wheelchair.

BACKGROUND OF THE INVENTION

5 When being transported by a wheelchair outdoor it happens that steps such as curbs must be passed, in both directions, i.e. the wheelchair is both to climb the step and the wheelchair must be capable of running down the step. Wheelchairs are allowed to be capable of passing such steps for a maximum height which for example can comprise 8 cm. In particular when passing down such a step there may exist a risk that
10 the wheelchair tips forwards and this risk can be largest for the type of wheelchairs having relatively large wheels placed in the front. When climbing a step the wheelchair can have a difficulty in advancing up a sharp step if it has a height which is a significant portion of the diameter of the front wheels of the wheelchair, and therefore there may exist a need for devices facilitating the climbing of such a step.

15 In U.S. patent 5,848,658 an anti-tip device for a wheelchair is disclosed which comprises elastically suspended, front stabilizer wheels. Helical compression springs are used together with link arms. In the published International patent application WO 98/46184 also front stabilizer wheels are disclosed which are attached to an articulated frame that is retained in its position by a centrally placed helical compression spring. In
20 the published French patent application 2 727 012 also a wheelchair having front anti-tip wheels is disclosed which are rotatably mounted at the front end of arms which by an elastic bearing are connected to the frame of the wheelchair.

DESCRIPTION OF THE INVENTION

It is an object of the invention to provide a device which in a relatively simple way
25 can reduce the risk of tipping forwards when being transported by a wheelchair down a step or similar thing.

It is another object of the invention to provide a device which facilitates for a wheelchair to climb sharp steps.

It is another object of the invention to provide a simple design of elastically
30 mounted, front anti-tip wheels.

An anti-tip device for a wheelchair which also facilitates climbing comprises stabilizer wheels that normally have no contact with the base material or ground over which the wheelchair passes and that are rotatably mounted to bars which project forwards, beyond the front wheels of the wheelchair. The stabilizer wheels are thus
35 placed in front of the ordinary wheels of the wheelchair and their lower sides or edges are located in a plane which is located above the plane passing through the lower sides or surfaces of the ordinary, support wheels of the wheelchair. The bars are designed as springs making the stabilizer wheels be elastically mounted so that they can move

upwards in a vertical plane when contacting an obstacle. The bars are relatively long in order to obtain sufficient elasticity and they are attached to the base of the wheelchair at places located rather far to the rear of the base, such as at a significant distance behind the rotational axis of the front ordinary wheels of the wheelchair. The elasticity of the bars laterally, i.e. in a horizontal plane, is restricted by guides. They can comprise slots made in suitably placed parts projecting from the base. The stabilizer wheels can suitably be incorporated in stabilizer assemblies having a simple design which comprise a guide plate having an elongated shape including a flange or bent portion at its front end, an elastic bar passing through a slot in the flange and attached to the rear portion of the guide plate, and a stabilizer wheel mounted to be freely rotatable at the free, front end of the bar. An adjustment device for limiting the elastic movement of the bar upwards and hence the movement of the stabilizer wheel upwards can be provided at the flange.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described as an non limiting embodiment of the invention with reference to the accompanying drawings in which

- Fig. 1 is a perspective view seen a little from above and from the side of a motor driven wheelchair having a front mounted, anti-tip device,
- Fig. 2 is a view from above of a wheel chassis for a wheelchair,
- Fig. 3 is a side view of only an anti-tip device, and
- Fig. 4 is a view from above of only an anti-tip device.

A PREFERRED EMBODIMENT

In Fig. 1 a wheelchair 1 is shown including the support wheels which when running the wheelchair support the wheelchair and comprises front support wheels 3 which are driven by a motor and rear non-driven supporting wheels 5. The front wheels 3 have a considerably larger diameter than the rear, freely rotating wheels 5 which are the caster type and thus are also freely movable around vertical axes. Furthermore, a seat 2 and a wheel base or chassis 9 are provided to which thus said wheels are rotatably mounted. To reduce the risk of the wheelchair tipping in a forward direction when it for instance passes down a step, stabilizer assemblies 11 are provided, see also the view from above of the wheel base in Fig. 2 and the views of only a stabilizer assembly in Figs. 3 and 4. A stabilizer assembly is arranged at each side of the wheelchair, close to the front, large support wheels 3. In Fig. 2 motors 12 are visible which individually drive the front wheels so that the direction of the wheelchair can be changed and controlled when being transported thereby.

A stabilizer assembly 11 includes a freely rotating stabilizer wheel 13 which is rotatably mounted to a shaft that is parallel to the axes of the front, large support wheels 3. The stabilizer wheel is mounted to the front end of a cylindric, elastic bar 15 that at

its rear end is rigidly, in particular as to rotations, attached to a clamping device 17 projecting from and attached to a guide plate 19. The guide plate 19 is in turn rigidly attached to the wheel base 9, inside a front, large wheel 3. The elastic bar 15 extends substantially horizontally, i.e. substantially in parallel to the base or ground which supports the wheelchair and on which it rests, and it is so long that the stabilizer wheel 13 is located having its front edge or surface located at a distance in front of the front edge or surface of the corresponding large support wheel 3.

The dimensioning of the stabilizer wheels and their location is made considering the largest height of steps which the wheelchair is intended to be capable of passing. If for example the wheelchair is intended to be capable of passing steps having a height of 8 cm, the guide plate 19 is placed so that the axis of the stabilizer wheel 13 is located at approximately the same height above the ground plane and somewhat thereabove, for instance at a height of between 8 and 9 cm. Furthermore, the stabilizer wheel 13 has a diameter which is significantly smaller than the diameter of the front support wheels 3 and is smaller than the diameter of the rear support wheels 5. For said height the stabilizer wheels can have a diameter of about 10 cm which gives a distance between the lower surfaces of the stabilizer wheels and a ground plane of 3 - 4 cm. The position of the stabilizer wheels in the longitudinal or front direction of the wheelchair is such that their front edges or surfaces are located at a considerable distance of the front edges or surfaces of the front support wheels 3. A plane which is tangent to the periphery of both the stabilizer wheels 13 and the large support wheels 3 can extend in an angle of for example 10 and 25° to the ground plane, in particular between 15 and 25° to the same plane. The bars are designed so that the stabilizer wheels can elastically move upwards for a distance of for instance at most 3 - 4 cm, the largest distance of which being dependent on the position of the adjustments screws to be described hereinafter.

When climbing a step, then, if the step has a height lower than the distance between the rotational axes of the stabilizer wheels 13 and the ground plane, surfaces of the stabilizer wheels 13 which are directed obliquely forwards will come in contact with the step. By the elasticity of the bars 15 then the stabilizer wheels are lifted and facilitate the passing of the step. The maximal elastic movement of the bars 15 can be set by adjustable adjustments screws 21 attached to flanges 23 of the guide plates 19. These flanges project rightly to the side, i.e. they are located perpendicularly to the plane through the main portion of the guide plates and they comprise simply a bent end portion of a guide plate. Each flange 23 is in itself substantially flat and the corresponding plane extends in an oblique angle to the longitudinal direction of the corresponding elastic bar 15, in particular an angle of about 45°. The flanges have two functions, both to receive the adjustment screws 21 passing through bores at the top

portion of the flanges and to guide the elastic bars 14 laterally by having them pass through elongated holes or slots 25 in the flanges. The elongated guide holes 25 have a width adapted to the diameters of the elastic bars and have their longitudinal direction extending in a vertical plane so that the upward movement of the free portions of the
5 bars is allowed.

When passing down a step, if the step has a sufficient height, the stabilizer wheels 13 can first come in contact with the ground below the step and can thereby prevent the wheelchair from tipping forwards. This risk is not entirely insignificant since a wheelchair of the type shown can have a center of gravity which is located at a rather
10 large height and which can be offset forwards in relation to the center of the wheel base.

Each stabilizer assembly 11 is a single unit which for a suitable design of the guide plate 19 can be attached to existing wheelchairs, both motor powered wheelchairs and wheelchairs not being motor driven. The main portion of the guide plate 19 can have an elongated, strip-like shape and is mounted to the chassis of the wheelchair adjacent to
15 the shaft of the front, large support wheels. Therefor the guide plates 19 can have recesses 27 at their upper edges. The main portions of the guide plates are mounted so that longitudinal axes of the main portions will be located approximatively horizontally. This gives the elastic bars a rather great length which makes it more easy to give them a suitable elasticity. The mounting places behind the rotary axes of the large wheels can
20 have such a distance of these axes that they are located completely behind the large wheels or close to the periphery thereof.

CLAIMS

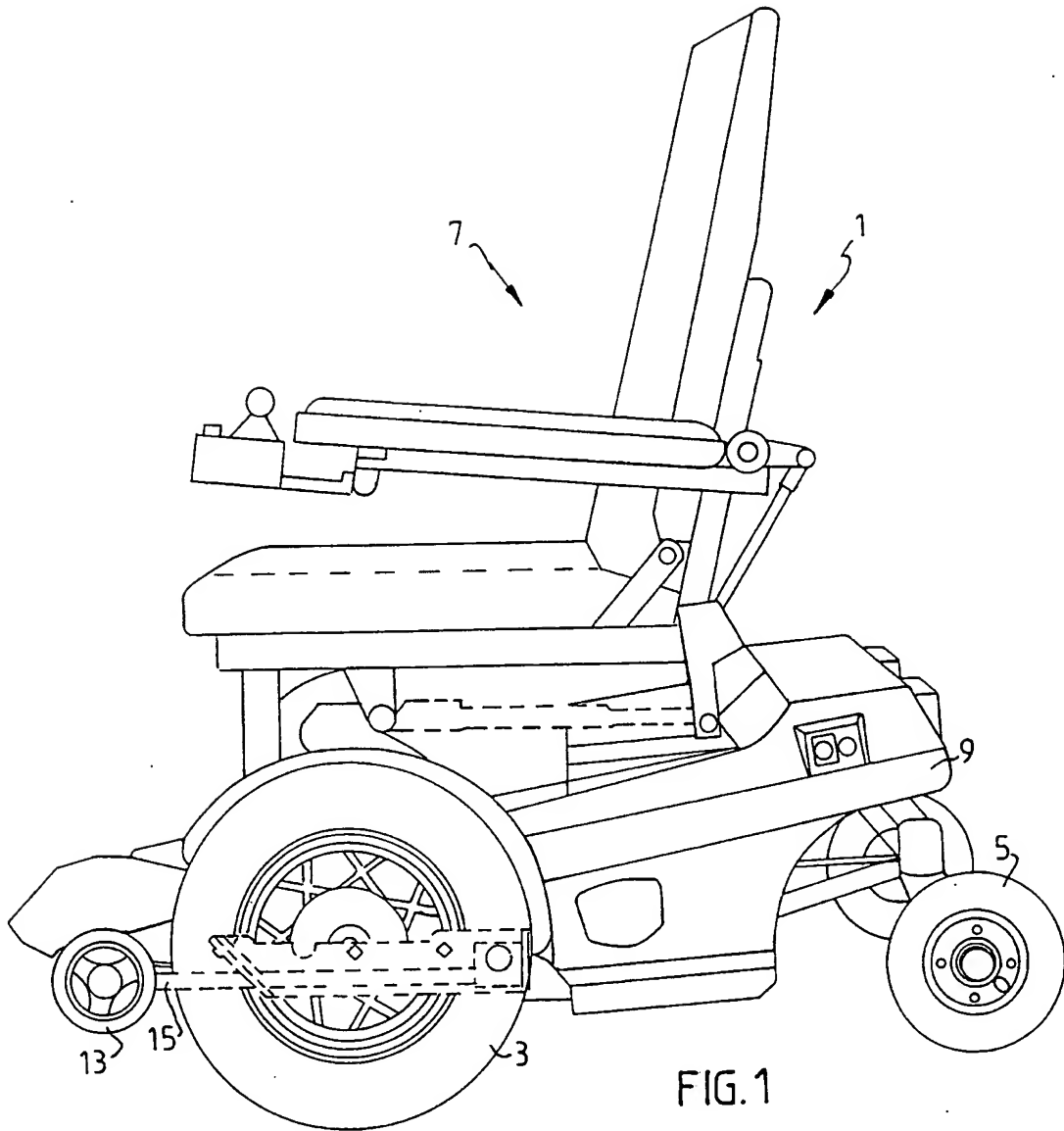
1. A wheelchair comprising a base structure, front and rear support wheels rotatably mounted to the base structure, a seat attached to the base structure and freely rotatable stabilizer wheels which are elastically mounted and located in front of the front support wheels and have lower surfaces located above a plane on which the support wheels rest. **characterized by** elastic bars which at rear ends are attached to the base structure, the stabilizer wheels being freely rotatably mounted at front ends of the elastic bars.
2. A wheelchair according to claim 1. **characterized in** that the elastic bars at their rear ends are attached to the base structure at places located behind, taken in the movement direction of the wheelchair, a rotary axis of the front support wheels.
3. A wheelchair according to claim 1. **characterized by** guides for the elastic bars so that the elastic bars can move elastically only in planes passing through the bars and are substantially perpendicular to a plane on which the support wheels rest.
4. A wheelchair according to claim 1, **characterized by** guide plates which are rigidly attached to the base structure and at rear edges comprise projections to which the elastic bars are rigidly attached.
5. A wheelchair according to claim 4, **characterized in** that the guide plates at front edges comprise guides for the elastic bars so that the elastic bars can only move elastically in planes extending through the bars and substantially perpendicular to a plane on which the support wheels rest.
6. A wheelchair according to claim 5, **characterized in** that the guides comprise flanges which project from the guide plates and comprise first elongated holes or slots through which the elastic bars extend.
7. A wheelchair according to claim 6, **characterized by** adjustment screws, the flanges comprising second holes through which the adjustment screws extend in directions towards the elastic bars to restrict upward movements of the elastic bars.
8. A wheelchair according to claim 6, **characterized in** that the flanges are substantially flat and project substantially perpendicularly from the main portions of the guide plates so that planes extending through the flanges form an oblique angle to the elastic bars.
9. A wheelchair according to claim 8, **characterized in** that the oblique angle is substantially 45°.
10. A wheelchair according to claim 8, **characterized by** adjustment devices to set a maximum deflection of the elastic bars in upward directions, the flanges comprising second holes which are located above the first elongated holes or slots and which receive the adjustment devices.
11. A wheelchair according to claim 1. **characterized by** adjustment devices for

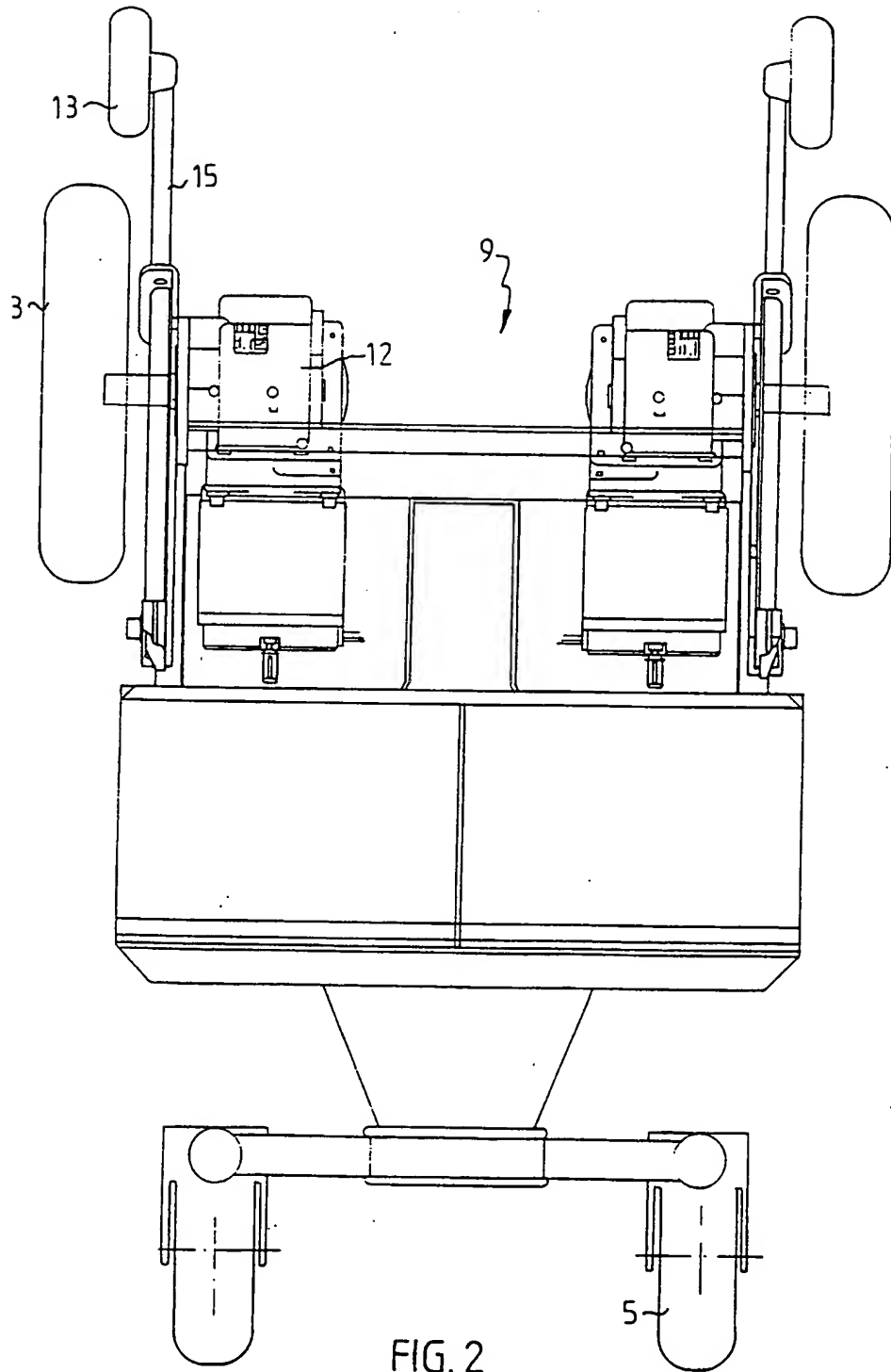
setting a maximum upward movement of the stabilizer wheels.

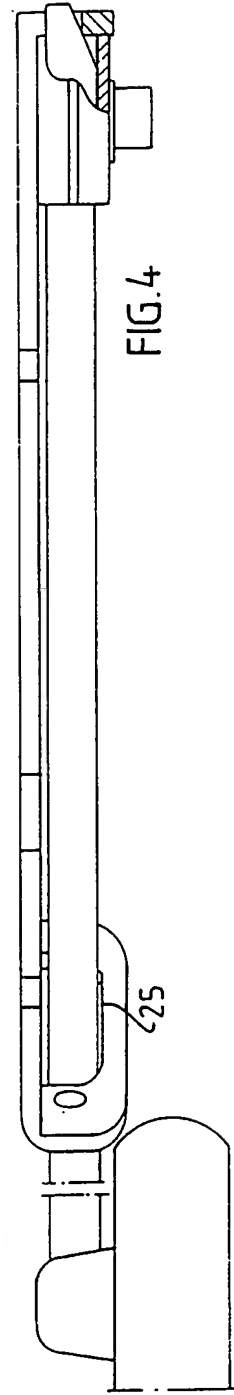
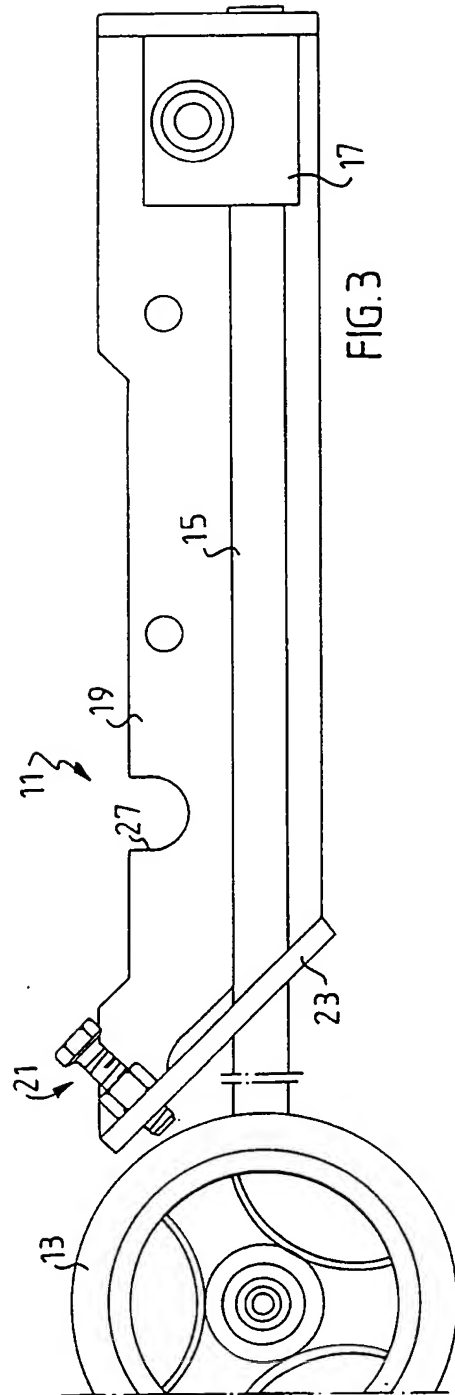
12. A wheelchair according to claim 11, **characterized in** that the adjustment devices comprise screws extending through parts projecting from the base structure and extending towards portions of the elastic bars to restrict, in upward movements of the
s elastic bars, these movements.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/00515

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61G 5/06, A61G 5/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5848658 A (DALE A. PULVER), 15 December 1998 (15.12.98), column 2, line 48 - column 4, line 41, figure 1	1-5,11,12
A	--	6-10
X	WO 9846184 A1 (PRIDE HEALTH CARE, INC.), 22 October 1998 (22.10.98), page 43, line 7 - page 45, line 5, figures 9,10,28,29,27	1-4,11,12
A	--	5-10
A	FR 2727012 A1 (DEGONDA REHAB SA SOCIEDAD ANONIMA), 24 May 1996 (24.05.96), page 6, line 28 - page 8, line 5	1
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☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Information on patent family members

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5848658 A	15/12/98	CA 2239690 A EP 0908165 A	06/04/99 14/04/99
WO 9846184 A1	22/10/98	AU 7118498 A GB 2334244 A GB 9913770 D	11/11/98 18/08/99 00/00/00
FR 2727012 A1	24/05/96	AU 3837895 A CA 2181439 A CN 1138825 A EP 0740542 A JP 9507785 T US 5964473 A WO 9615752 A	17/06/96 30/05/96 25/12/96 06/11/96 12/08/97 12/10/99 30/05/96